



**Faculty of Engineering and Technology**  
**Electrical and Computer Engineering Department**

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**ENCS5343 Computer Vision**  
**Assignment # 1**

**Student name:**

**Student ID:**

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**Notes:**

- 1- Use this page as a cover for your home work.
- 2- Late home works will not be accepted (the system will not allow it).
- 3- Due date is December 18<sup>th</sup>, 2023 at 11:59 pm on ritaj.
- 4- Report including Input and Output images (Soft Copy). Include all the code you write to implement/solve this assignment with your submission.
- 5- Organize your output files (images) as well as used codes to be in a folder for each question (Q1, Q2, etc.). Then add the solution of all questions along with this report in one folder named Assign1. Compress the Assign1 folder and name it as (Assign1\_LastName\_FirstName\_StudetnsID.Zip).
- 6- Please write some lines about how to run your code.
- 7- You might need to use OpenCV Python in your implementation.

**Quetsion#1**

Look for an image from the internet with the following properties: 8-bit gray-level, 256x256 pixels in size.

- 1- Show this image. Don't use your friends' ones.
- 2- Apply a power law transformation with  $\gamma=0.4$  to the image and show the image after the transformation.
- 3- Add a zero-mean Gaussian noise (with variance =40 gray-levels) to the original image and show the resulting image.
- 4- Apply a 5 by 5 mean filter to the noisy-image you obtained in point 3 above and show the result. Discuss the results in your report.
- 5- Add salt and pepper noise (noise-density=0.1) to the original image and then apply a 7 by 7 median filter to the noisy-image and show both images.
- 6- Apply a 7 by 7 mean filter to the salt and pepper noisy-image and show the result. Discuss the results in your report.
- 7- Apply a Sobel filter to the original image and show the response (don't use ready functions to do this part).

## Quetsion#2

Write a function that convolves an image with a given convolution filter

*function [output\_Image]= myImageFilter( Input\_image, filter)*

Your function should output image of the same size as that of input Image (use padding). Test your function (on attached images “House1.jpg” and “House2.jpg”) and show results on the following Kernels.

- 1- Averaging Kernel (3×3 and 5×5 )
- 2- Gaussian Kernel ( $\sigma = 1, 2, 3$  ) Use  $(2\sigma + 1) \times (2\sigma + 1)$  as size of Kernel (You may write a separate function to generate Gaussian Kernels for different values of  $\sigma$ ). Discuss the results in your report.
- 3- Sobel Edge Operators:  
$$\begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{bmatrix} \text{ and } \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix}$$
- 4- Prewitt Edge Operators:  
$$\begin{bmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{bmatrix} \text{ and } \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ -1 & -1 & 1 \end{bmatrix}$$

**Question#3**

Attached “Noisyimage1” and “Noisyimage2” are corrupted by salt and pepper noise. Apply 5 by 5 Averaging and Median filter and show your outputs. Why Median filter works better than averaging filter?

**Quetsion#4**

Compute gradient magnitude for attached image “Q4\_Image” (using built-in sobel gradients function).

1. Stretch the resulting magnitude (between 0 to 255) for better visualization
2. Compute the histogram of gradient magnitude
3. Compute gradient orientation (the angle of gradient vector)
4. Compute histogram of gradient orientation (angle between 0 and  $2\pi$ )

**Quetsion#5**

Load *walk\_1.jpg* and *walk\_2.jpg* images in Python. Convert them to gray scale and subtract *walk\_2.jpg* from *walk\_1.jpg*. What is the result? Why?

**Quetsion#6**

Apply canny edge detector on the “Q\_4.jpg” using OpenCV function “Canny”. Test different values of ‘Threshold’.

**(Good Luck)**